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REPORT

ON

ROBERT FARIES,

CIVIL ENGINEER

ON THE

ALLEGHENY PORTAGE RAILROAD.

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REPORT.

To the Board of Canal Commissioners of Pennsylvania:

GENTLEMEN:—The following report relative to the new work for the avoidance of the inclined planes of the Allegheny Portage railroad, the western reservoir, and the Shamokin schute, is respectfully submitted.

On the tenth of June last, a portion of the new work for the avoidance of the planes, on the western slope of the mountain, commencing on the long level of the old road, about one mile below the foot of plane, No. 2, and extending to a point opposite the foot of plane, No. 4, a distance of five miles, together with a mile and a half in the vicinity of the head waters of Clearfield creek; and, the balance of the distance, to the western end of the proposed tunnel, at Sugar run gap, on the first of October last; making the whole distance now under contract, eleven miles and eighty rods.

A short distance below the foot of plane, No. 3, the new line crosses the old road, on the same level with the old road, affording an opportunity of connecting with it. As soon, therefore, as the new work is completed to this point, plane, No. 2, may be abandoned. Owing to the late date at which the work was allotted, the contractors, generally, were not prepared to prosecute their jobs until after the harvest season; but, since that time, it has been steadily progressing, and, at an early day in the spring, the grading on this portion of the line will be completed and ready for laying the track. Strong hopes are, therefore, entertained, that, by the fifteenth of June next, it will be ready for running. This distance, taken in connexion with the long level to the stone viaduct, and the Central railroad, from the stone viaduct to their intersection with the State road below Corktown, a distance of about five miles (which will shortly be completed, and avoid plane, No. 1), thence by the State road to Johnstown, will give a distance of nearly twenty miles from Johnstown east, which will be uninterrupted by inclined planes.

It is presumed that a temporary arrrangement can be made between the Commonwealth, under existing circumstances, and the Central railroad company, that will be beneficial to both, and until plane, No. 1, can be avoided.

For a portion of the distance, between plane, No. 3 and plane No. 4, it was considered more economical and a safer arrangement, both for the State road and the Central road, to change the channel of the Conemaugh river at two different points. The Central railroad company are to excavate the new channel, and the State to pay the damage done to a saw mill in the vicinity. The work between plane, No. 3, and plane, No. 4, although not as far advanced as that between plane, No. 2, and plane, No. 3, may be completed and ready for use by the first of August next, unless retarded by delay on the part of the Central railroad company. Until the new channel is excavated, the old channel cannot be closed. It is hoped, however, that this part of their work will be completed in due time, so that a temporary connexion with a switch branch may be formed at the foot of plane, No. 4, and thus bring this part of the new road into usefulness against the time contemplated.

The work on several of the sections between the foot of plane, No. 4, and the western end of the proposed tunnel, has been commenced, but it is not essential that the lighter sections on this portion of the line should be driven, as the line from the foot of plane, No. 4, to the tunnel, cannot be used until the tunnel and the greater part of the eastern slope of the mountain is constructed. Sections, Nos. 17, 19, and 20, are comparatively heavy work, and it is desirable to have them urged forward, but, more particularly, section, No. 20, as it embraces the western approach to the tunnel, and the tunnel cannot be worked from that end until section, No. 20, is completed.

In revising the line on the western slope of the mountain, previously to the work being let, a maximum grade of sixty-six feet per mile was adopted on straight lines, in approaching the summit, for about two miles. By adopting this gradient, a more direct line was obtained; and by continuing the maximum grade on the eastern slope of the mountain, a short distance beyond the western end of the proposed tunnel, the length of the tunnel will be reduced to eighteen hundred feet, in place of being two thousand three hundred feet, which was the original contemplated length.

Upon a road of the character of the Portage road, there seems to be no particular objection to assimilating the grades on the respective slopes of the mountain, except so far as there is a surplus of tonnage on one side over the other to be transported. If the distance were three times as great on one side of the summit, as on the other, it might be policy to keep down the grades if possible, and employ an assistant engine, or an engine of greater power, on the short slope having the higher gradients; but when the distance is but one-third greater in one direction than it is in the other, there appears to be no inducement to resort to auxiliary aid, particularly, if the surplus tonnage is to be conveyed in the direction of the longest slope approaching the summit, which, it is presumed, will be the case by the time the road is made.

So far as the road has been put under contract, the location has been with a view to a double track hereafter. The bridges and culverts have all been founded for a double track. It is also contemplated to tunnel for a double track, and in the deep cuts, where it might interfere with the running of the road after the first track is completed, the excavations will be made of sufficient width for the second track; but throughout the line generally, the intention is to grade for a single track, so as to bring the work into usefulness at the smallest expense, consistent with prudent economy, and to place it in the most favorable shape for a second track when it may be required.

The superstructure of the road will be a T rail, weighing seventy-three pounds to the yard, laid upon cross-ties, placed two feet from centre to centre; the cross-ties to be bedded on ballast of broken stone, one foot in depth. The rails are to be secured to each cross-tie with broad headed spikes, and, at the ends or joints, will rest on a wrought iron chair, secured by four spikes, which will clasp the rails. The joints will also be secured by splicing plates, two feet in length, firmly bolted to the rails. The following is an approximate estimate of the cost of grading and masonry, for that portion of the line now under contract, based upon the prices at which the work has been let.

Section, No. 1—Length 2,700 feet.—Henry McBride, Contractor.

Grubbing and clearing,			$800 00	
18,700 cubic yards common excavation, at	10	cents	1,870 00	
600 do. do. loose rock, at	28	do.	168 00	
52,300 do. do. embankment, at	12	do.	6,276 00	
650 perches bridge masonry, at	$4 25	do.	2,762 50	
1,400 lineal feet timber in foundation, at	18	do.	252 00	
2,600 feet plank, (b. m.) do. at	$10 00	do.	26 00	
80 lineal feet bridge superstructure, at	$20 00	do.	1,600 00	
				$13,754 50

Section, No. 2—Length 2,600 feet.—White, Bridgens & Co., Contractors.

Grubbing and clearing,			$400 00	
14,000 cubic yards common excavation, at	10	cents	1,400 00	
4,000 do. do. loose rock, at	33	do.	1,320 00	
300 do. do. solid do. at	50	do.	150 00	
24,500 do. do. embankment, at	16	do.	3,920 00	
500 perches culvert masonry, at	$5 50	do.	2,750 00	
1,700 lineal feet timber in foundation, at	12	do.	204 00	
1,600 feet plank (b. m.) at	$20	per M.	32 00	
				$10,176

Section, No. 3—Length 3,200 feet.—H. B. Blanchard, Contractor.

Grubbing and clearing,			$450 00	
9,100 cubic yards common excavation, at	12 cents,		1,092 00	
3,000 do. do. loose rock at	31 do.		930 00	
2,600 do. do. solid do. at	50 do.		1,300 00	
26,800 do. do. embankment, at	10 do.		2,680 00	
140 perches dry drain masonry, at	$2 00		280 00	
400 do. retaining wall, at	1 00		400 00	
				$7,132 00

Section, No. 4—Length 3,000 feet.—Denworth and Rankin, Contractors.

Grubbing and clearing,			$600 00	
11,300 cubic yards common excavation, at	14 cents,		1,582 00	
3,000 do. do. loose rock, at	20 do.		600 00	
1,000 do. do. solid do. at	45 do.		450 00	
22,400 do. do. embankment, at	6 do.		3,584 00	
160 perches dry drain masonry, at	$1 25		200 00	
				$7,016 00

Section, No. 5—Length 3,000 feet.—John B. Beck & Co., Contractors.

Grubbing and clearing,			$350 00	
8,400 cubic yards common excavation, at	14½ cents,		1,218 00	
1,600 do. do. loose rock, at	33 do.		528 00	
600 do. do. solid do. at	50 do.		300 00	
10,700 do. do. embankment, at	15 do.		1,605 00	
40 perches dry drain masonry, at	$1 50		60 00	
				$4,061 00

Section, No 6—Length 3,100 feet.—Solomon McCullough, Contractor.

Grubbing and clearing,			$600 00	
6,600 cubic yards common excavation, at	12 cents,		792 00	
2,000 do. do. loose rock, at	25 do.		500 00	
1,000 do. do. solid do. at	40 do.		490 00	
25,300 do. do. embankment, at	13 do.		3,289 00	
100 perches dry drain masonry, at	$2 00		200 00	
30 do. retaining wall, do. at	1 50		45 00	
				$5,916 00

Section, No. 7—Length 2,400 feet.—T. B. Shugert & Co., Contractors.

Grubbing and clearing			$550 00	
2,800 cubic yards common excavation, at	12 cents		336 00	
3,000 do. loose rock, at	22 do.		660 00	
1,500 do. solid do. at	45 do.		675 00	
16,700 do. embankment, at	10 do.		1,670 00	
100 perches dry drain masonry, at	$2 00		200 00	
				$4,091 00

Section, No. 8—Length 3,000 feet.—T. B. Shugert & Co., Contractors.

Grubbing and clearing,			$900 00	
10,400 cubic yards common excavation, at	14 cents		1,456 00	
6,000 do. loose rock, at	22 do.		1,320 00	
4,000 do. solid do. at	45 do.		1,800 00	
5,800 do. embankment, at	10 do.		580 00	
100 perches dry drain masonry, at	$2 00		200 00	
				$6,256 00

Section, No. 9—Length 3,200 feet.—Miles & Kephart, Contractors.

Grubbing and clearing,			$450 00	
1,500 cubic yards common excavation, at	10 cents,		150 00	
400 loose rock, at	30 do.		120 00	
100 solid do. at	48 do.		48 00	
9,000 embankment	22 do.		1,980 00	
100 perches bridge masonry, at	$3 50		350 00	
60 " dry drain do., at	2 00		120 00	
Bridge superstructure,			50 00	
				$3,268 00

Section, No. 10—Length 5,000 feet.—A. Edwards & Co., Contractors.

Grubbing and clearing,			$450 00	
5,000 cubic yards common excavation, at	11 cents,		550 00	
1,500 do. loose rock, at	26 do.		390 00	
1,000 do. solid do. at	48 do.		480 00	
4,000 do. embankment, at	12 do.		480 00	
180 perches dry drain masonry at	$2 25 do.		405 00	
				$2,755 00

Section, No. 11—Length 4,809 feet.—Dull & Miller Contractors.

Grubbing and clearing,			$600 00	
10,500 cubic yards common excavation, at	11 cents,		1,155 00	
3,500 do. loose rock, at	20 do.		700 00	
1,500 do. solid do, at	55 do.		825 00	
27,000 do. embankment, at	11 do.		2,970 00	
300 perches bridge masonry, at	$4 50 do.		1,350 00	
300 do. culvert do. at	5 00		1,500 00	
80 do. dry drain do. at	2 00		160 00	
2,500 lineal feet timber in foundation, at	12 do.		300 00	
2,000 feet plank (b. m.), at	13 00		26 00	
50 do. bridge superstructure, at	10 00		500 00	
				10,086 00

Section, No. 12—Length 4,000 feet.—Myirs & Hice, Contractors.

Grubbing and clearing,			$200 00	
5,000 cubic yards common excavation, at	13 cents,		650 00	
1,400 do. loose rock, at	28 do.		392 00	
600 do. solid do. at	49 do.		294 00	
12,000 do. embankment, at	12 do.		1,440 00	
150 perches dry drain masonry, at	$2 50		375 00	
				$3,351 00

Section, No. 13—Length 2,700 feet.—Andrews & Barr, Contractors.

Grubbing and clearing,			$500 00	
4,500 cubic yards common excavation, at	11 cents,		495 00	
1,500 do. loose rock, at	21 do.		315 00	
500 do. solid rock, at	45 do.		225 00	
10,800 do. embankment, at	12 do.		1,296 00	
80 perches dry drain masonry, at	$2 00		160 00	
25 square rods turnpike (est.), at	8 00		200 00	
				3,191 00

Section, No. 14—Length 2,900 feet.—Colt & Horton, Contractors.

Grubbing and clearing,			$385 00	
7,000 cubic yards common excavation, at		13 cents,	910 00	
1,000 do. loose rock, at		26 do.	260 00	
600 do. solid rock, at		49 do.	294 00	
13,000 do. embankment, at		13 do.	1,690 00	
500 perches culvert masonry, at	$4 96		2,480 00	
40 do dry drain do.	1 25		50 00	
				6,069 00

Section, No. 15—Length 2,600 feet.—Glover & Hubbs, Contractors.

Grubbing and clearing,			$100 00	
6,500 cubic yards common excavation, at		11 cents,	715 00	
1,500 do. loose rock, at		22 do.	330 00	
1,000 do. solid rock, at		42 do.	420 00	
12,300 do. embankment, at		13 do.	1,599 00	
80 perches dry drain masonry, at	$2 00		160 00	
				3,324 00

Section, No. 16—Length 1,700 feet.—Burke, Gonder & Co., Contractors.

Grubbing and clearing,			$400 00	
6,500 cubic yards common excavation, at		15 cents,	975 00	
2,000 do. loose rock, at		30 do.	600 00	
1,000 do. solid rock, at		50 do.	500 00	
8,000 do. embankment, at		15 do.	1,200 00	
60 perches dry drain masonry, at	$2 50		150 00	
				3,825 00

Section, No. 17—Length 3,500 feet.—Burke, Gonder & Co., Contractors.

Grubbing and clearing,			$600 00	
27,000 cubic yards common excavation, at		15 cents,	4,040 00	
16,000 do. loose rock, at		30 do.	4,800 00	
8,000 do. solid rock, at		50 do.	4,000 00	
127,000 do. embankment, at		15 do.	19,050 00	
500 perches culvert masonry, at	$5 00		2,500 00	
				35,000 00

Section, No. 18—Length 1,200 feet.—Burke, Gonder & Co., Contractors.

Grubbing and clearing,			$400 00	
7,000 cubic yards common excavation, at		15 cents,	1,050 00	
4,000 do. loose rock, at		30 do.	1,200 00	
2,000 do. solid rock, at		50 do.	1,000 00	
13,000 do. embankment, at		15 do.	1,950 00	
40 perches dry drain masonry, at	$2 50		100 00	
				5,700 00

Section, No. 19—Length 2,000 feet.—John McGovern, Contractor.

Grubbing and clearing,			$450 00	
25,000 cubic yards common excavation, at		9 cents,	2,250 00	
20,000 " " loose rock, at		22 do.	4,400 00	
13,000 " " solid do. at		42 do.	5,460 00	
60,000 " " embankment, at		10 do.	6,000 00	
900 perches culvert masonry, at	$3 75		3,375 00	
				$21,935 00

Section, No. 20—Length 2,100 feet.—Samuel Caldwell, Contractor.

Grubbing and clearing,		$450 00	
25,000 cubic yards common excavation, at	12 cents,	3,000 00	
30,000 " " loose rock, at	33 do.	9,900 00	
25,000 " " solid do. at	44 do.	11,000 00	
1,000 " " embankment, at	15 do.	150 00	
80 perches dry drain masonry (est.), at $2 00		160 00	
			$24,660 00
			$181,566 50
Add cost of 11¼ miles of superstructure, - - - -			$117,500 00
Total cost of work from western end of tunnel to intersection with long level, - - - - - - - -			$299,066 00

In my report of January last, my estimate for grading and masonry, from west end of tunnel to stone viaduct, adopting the long level of the old road, from the point one mile below the foot of plane, No. 2, was one hundred and forty thousand dollars, graded for a single track, and, one hundred and thirty-five thousand dollars for a single track superstructure. The tunnel was estimated at one hundred and sixty-five thousand dollars, including two tracks of superstructure. Notwithstanding the work under contract embraces a certain extent of work for a double track, and will have a heavier rail than was contemplated in my first report, yet, in connexion with the decreased length of tunnel, the cost of this portion of the line is not likely to exceed my estimate for a single track road.

Comparison of present estimate with original estimate.

Original estimate for single track with double track in tunnel.			
Cost of grading and masonry for part under contract,		$140,000 00	
Cost of superstructure,		135,000 00	
Do. tunnel, 2,300 feet long,		165,000 00	
			$440,000 00
Present estimated cost.			
Grading and masonry as per contract prices,		$181,566 50	
Superstructure (est'd),		117,500 00	
Tunnel, 2,300 feet (est'd),	$165,000 00		
Deduct 500	35,000 00		
—— 1,800 feet (est'd),		130,000 00	
			429,066 50
Difference in favor of present line,			$10,933 50

If my original estimate for the tunnel is sufficient for the work, and I am inclined to believe that it will be found amply so, as the Central railroad, I have understood, are getting their tunnel excavated for a considerable less sum per cubic yard, than my estimate was predicated upon, although their tunnel will be double the length; which, consequently, enhances the cost of the work, yet there will still be a margin of nearly eleven thousand dollars on this portion of the line for unforeseen contingencies, and, I have no doubt, but that my original estimate for the eastern slope of the mountain will be found sufficiently full to construct the work; and also, my estimate for the avoidance of plane, No. 1. I would, therefore, refer the board to my last report for any data they may require relative to those portions of the line. In avoiding plane, No. 1, instead, however, of surveying into the cut made by the Central railroad company through the tunnel hill, I would recommend, since the

maximum grade has been increased on the western slope of the mountain, beyond that contemplated in my last report, that the tunnel be cut down fifteen or twenty feet at the western end; this would reduce the elevation at that point to two hundred and thirty feet above Johnstown, which could be overcome with an average grade of fifty-seven and a half feet per mile, in four miles. The distance from Johnstown to the western end of the tunnel, at the head of plane, No. 1, is four miles, and two thousand feet by the old road. By this arrangement the line would be more direct and would not increase the cost of the work. True economy would require that the work for the avoidance of the inclined planes, should be prosecuted to completion with the least possible delay. In my last report I fully demonstrated the enormous sacrifice the Commonwealth was yearly making, until the planes could be avoided; and had a sufficient appropriation at the last session of the Legislature been obtained, the whole work could have been completed by the spring of 1853. The tunnel and heavy work on the eastern slope of the mountain, cannot be constructed in much less time than two years, and to place the work in a position so as to have the whole of the new line completed by the spring of 1854, an appropriation of five hundred thousand dollars will be required at the next session of the Legislature.

I would respectfully call the attention of the board to the propriety of directing the supervisor having charge of the old road, hereafter, in all repairs that are required on such parts of the old road as will be used in connexion with the new work, for the avoidance of the planes, that they be made of the most substantial kind, and, to coincide as nearly to the character of the new work as prudent economy would dictate. In the appropriation for repairs a certain sum should be designated for straightening the line, as in many places, for a very trifling sum, the old road might be much improved. From the point where the new work starts, below the foot of plane, No. 2, to Jefferson, a distance of about two miles, there are not less than ten distinct curves, where but three are required, and, to straighten this part of the road, it would not cost more than eight thousand dollars. To lay down a substantial superstructure on this portion of the road, without improving the line, would seem to be extreme folly. The most objectional curve, however, is the one at Pringle's Point, between Jefferson and the Half-way House. It has a radius of only four hundred and fifty feet.

The Central railroad company are carrying their line through the point with a deep cut. By starting a short distance back, on the Portage road, and grading up, so as to occupy a position immediately along side of the Central road, the line would be greatly improved, and at a comparatively trifling expense to what it would cost to make a thorough cut through the hill. No estimate has been made of the cost of straightening the different curves on that portion of the long level that it is contemplated to use; but, it is believed, that the whole distance may be materially improved for a sum not exceeding seventy-five thousand dollars in addition to the amount that will be required to keep the line as it now stands in repairs; a very small sum in comparison to the great advantage that would be gained in the expenses of running the road.

Western Reservoir.

The work for the completion of the Western reservoir was commenced by Messrs. Moorhead & Parker, the original contractors, about the first of May last, and has been prosecuted with a strong force since that time. Every exertion was made to have the embankment of a sufficient height, and the sluices in a fit condition to retain water for a partial supply, in case of a deficiency in the canal during the past summer, but, before this could be accomplished the dry season set in, and dried up the streams to such a degree, as to entirely cut off the supply necessary for the purpose.

The effect during the dry time of the past season fully exemplifies the great necessity of completing the Western reservoir with the least possible delay. The

injury done to the work by floods during its suspension, cannot be estimated at less than ten thousand dollars, and those who are familiar with the transportation business on the State works, estimate the loss to the Commonwealth during the past season, for the want of a full supply of water for the canal west of the mountain, at not less than one hundred thousand dollars, and some even put it as high as two hundred thousand dollars. The loss in the shape of tolls does not extend merely to that portion of the canal that is rendered useless, but the effect is felt throughout the whole length of the State improvements from Philadelphia to Pittsburg. Within the last ten years, the probability is, that the Commonwealth has lost nearly half a million of dollars, owing to the scarcity of water in the canal during portions of the boating season. Since the completion of the Eastern reservoir, although its capacity is not half so great as that of the Western reservoir, yet the canal east of the mountain has never suffered materially for the want of water. The height of the Western reservoir above the sluice pipes will be seventy-five feet; it will be eight hundred and sixty feet long on top, and the base of the embankment at the widest point three hundred feet; the area of ground covered by water will be four hundred acres, and the available quantity four hundred and eighty million cubic feet. No doubt can therefore, exist, when the reservoir is completed, but that there will be an abundant supply of water for the canal west of the mountain, under the most unfavorable circumstances.

The following estimate of the cost of completing the work, is predicated on the contract prices:

1,000	cubic yards common excavation, at	15	cents,	$150 00
15,000	do. slate and detached rock, at	32	do.	4,800 00
40,000	do. solid rock, at	44½	do.	17,800 00
130,000	do. good earth embankment, at	25	do.	32,500 00
95,000	do. coarse do.	30	do.	28,500 00
250	do. slope wall, at	$1 64		410 00
2,000	do. puddling, at	38	do.	760 00
1,250	perches masonry and sluice, at	6 43		8,037 50
5,000	bushels of cement, at	35	do.	1,750 00
Timber tower (est.), at				1,000 00
Iron work, cast and wrought (est.), at				1,550 00
				$97,257 50
Deduct materials furnished by Commonwealth,				1,256 20
				$96,001 30
Deduct appropriation,				45,000 00
				$51,001 30
Add for land damages, superintendence, and contingencies,				3,998 70
Amount required to complete,				$55,000 00

Shamokin Schute.

During the past fall repairs have been put upon the Shamokin schute, even beyond the amount appropriated by the Legislature for that purpose, but when the water was shut out at the head and the repairs commenced, it was found that the timbers in the side walls were in a great measure rotten; and repairs to a much greater extent were found to be absolutely necessary, than had been contemplated; still, at a low stage of the water, with all that has been done, it is unsafe for rafts to pass. When the river is at a high stage for running, the probability is that rafts would pass with safety, but to make it safe at all stages of the water, it will be necessary to extend it over the ledges of rock at the lower end, and the only mode

by which it can be done to destroy the breakers at the lower end, will be to carry the bottom for several hundred feet below the recent work with timber laid side and side, and held down by a sufficient weight of side walls. An idea exists with some persons, that by extending the schute into the pool of the dam, the force of the water is overcome in a greater degree, in proportion to the length of the schute, than if extended below the dam. Any reflecting mind will at once see that this must be an erroneous idea. The quantity of water introduced at the head, to give sufficient depth for the rafts to enter must be the same, whether extended into the pool, or carried below the dam; and the safety of running depends entirely upon the velocity with which the body moves, and the obstructions with which it meets in its descent. By extending the schute into the pool of the dam, the expense would be three times as great as it would be to extend it below the dam. To carry out the repairs as contemplated, and to pay the balance due beyond the appropriation of last year, the sum of ten thousand dollars will be required.

ROBT. FARIES,
Civil Engineer.